

Nebraska Information Technology Commission

Project Proposal Form

**New or Additional State Funding Requests
for Information Technology Projects**

Project Title	Convert Lincoln NSOB to Ethernet Topology
Agency/Entity	Health and Human Services System

Project Proposal Form**Section I: General Information**

Project Title	Convert Lincoln NSOB to Ethernet Topology
Agency (or entity)	HHSS, Health and Human Services System

Contact Information for this Project:

Name	Steven Mayer
Address	1410 M Street, Lower Level
City, State, Zip	Lincoln, NE 68508
Telephone	(402) 471-9527
E-mail Address	steve.mayer@hhss.state.ne.us

Section II: Executive Summary

This project proposes to replace the Token Ring network topology used by HHSS (Health and Human Services System) in the NSOB (Nebraska State Office Building in Lincoln) with Ethernet. Ethernet is the leading network topology in use today and, as such, benefits from technological advancements in reliability, scalability and cost containment. Existing Token Ring equipment has exceeded its technical life expectancy (in use since the 1970s) and we are seeing a high rate of failure. Replacement parts are getting scarce making them very expensive. Technically skilled people required to maintain the Token Ring environment are much harder to find.

This project also addresses data cabling issues. The data cabling in place no longer meets approved standards and cannot support today's higher data transmission rates required by increased utilization and newer applications. Existing data cabling needs to be replaced according to guidelines and specifications from the Department of Administrative Services, Division of Communications.

This project supports the Agency's staff and ultimate mission of helping people live better lives through **effective** health and human services. The availability of reliable, scalable data network services is essential to the 935 staff from Finance & Support, Health & Human Services and Regulation & Licensure performing their job in the NSOB.

This project also supports the NITC (Nebraska Information Technology Commission) goal of coordinating investment in telecommunications infrastructure so as to aggregate demand, reduce costs and create support networks. The Division of Communications (DOC) and Information Management Services (IMS) have been asked to provide input and assistance in the design, implementation and support of this project. This collaboration of effort will ensure resulting infrastructure meets available guidelines and addresses NITC objectives.

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Section III: Goals, Objectives, and Projected Outcomes (15 Points)

The specific goal of this project is to implement fast, reliable data network services to the 935 users in the NSOB that depend on the network to accomplish their job requirements and provide vital services to the citizens of Nebraska. This project will provide a more cost effective, reliable, available data network with faster response times equating to a more productive workforce. Newer equipment will provide advanced management components enabling pro-active monitoring, improved preventive maintenance and faster problem resolution. The technology being replaced is over twenty-five years old and unable to keep pace with demands.

All data lines installed will be tested and certified to meet industry standards and provide dependable data transfer rates at high speed. Problems and technical service requests (TSRs) are tracked on a regular basis. The number and "time required to resolve/satisfy" will be reduced. Improved response times and higher data transfer rates will be measured using available monitoring techniques.

HHSS is committed to leveraging technology to simplify workflow, enhance communications, improve productivity, reduce costs and effectively manage and distribute information. State and Federal requirements, new HIPAA (Health Insurance Portability and Accountability Act) security and privacy rules and the recent threat of terrorism are forcing HHSS to take a more aggressive approach to system access and data security. The implementation of a sound, efficient local area network will allow us to capitalize on new technical advancements and meet the challenges we face. Many of the goals specified in our Information Technology Plan are dependent on a reliable network infrastructure capable of carrying a higher volume of traffic. Examples include:

- Deployment of Lotus Notes applications and databases to all desktops
- Broadening educational opportunities via computer based training
- Rapid software deployment to support new and ongoing programs
- Streamlining support services
- Initiatives to capitalize on Internet, Intranet and e-government services
- Streaming audio and/or video to the desktop
- Offering of new tools and techniques to share and process data more efficiently

Section IV: Project Justification / Business Case (25 Points)

4. Provide the project justification in terms of tangible benefits (i.e. economic return on investment) and/or intangible benefits (e.g. additional services for customers).

Tangible benefits include reduction in down time, increased productivity and less costly ongoing operations and upkeep. Stability and reliability are expected to reduce downtime by 1 hour per month. Based on 935 users at an average rate (not including benefits) of \$10/hour this equates to \$9,350 worth of additional production time a month. Faster response times mean an increase in productivity. A modest 1% gain in productivity for 935 workers equates to a productivity gain of \$15,580 a month based on average annual salary of \$20,000. Ethernet NICs (Network Interface Cards) are standard on new workstations. Token Ring NICs are currently being "salvaged" from older machines and reinstalled on new workstations. Anticipated labor savings from not having to install Token Ring NICs amounts to \$1,000 per month based on an average of 20 installs per month. Network components for Token Ring are about 5 times higher than Ethernet counterparts. Given an annual expenditure of about \$30,000 in Token Ring replacement parts, Ethernet equivalents would run about \$6,000, an average monthly savings of \$2,000. Total savings amounts to \$36,000 per year. Productivity gains amount to just under \$300,000 per year.

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Less tangible but equally important benefits include enhanced data/access security, increased employee satisfaction, quicker turnaround for customers and clients, reduced technical overhead by standardizing on a single network protocol and more flexibility. Implementation of industry standard Ethernet topology will provide a secure, scalable long-term solution to data network requirements.

5. Describe other solutions that were evaluated, including their strengths and weaknesses, and why they were rejected. Explain the implications of doing nothing and why this option is not acceptable.

There are no other viable solutions to the overall concept of re-cabling the facility and migrating to an Ethernet network topology. DOC and IMS are helping evaluate various brands and models of Ethernet core switches, high-speed Ethernet switches for individual quadrant closets and equipment required to enable a graceful transition from Token Ring to Ethernet. DOC has established policies and guidelines that dictate the type and installation of data cabling.

Doing nothing is not an option. The existing network infrastructure is aging and failure rates are increasing. Repair and maintenance is no longer cost effective. Newer workstations, servers and applications require additional network resources that are taxing the current infrastructure. Token Ring technology has not kept pace with Ethernet in terms of market share, data transfer rates, manageability and costs. Ethernet offers lower initial and on-going costs, flexibility, scalability and more vendor options.

6. If the project is the result of a state or federal mandate, please specify the mandate being addressed.

This project is not a direct result of a state or federal mandate but is the result of business technology need. Implementation of Ethernet topology in the NSOB will enable us to meet increased data transmission demands and increasing security concerns and requirements.

Section V: Technical Impact (20 Points)

7. Describe how the project enhances, changes or replaces present technology systems, or implements a new technology system. Describe the technical elements of the project, including hardware, software, and communications requirements. Describe the strengths and weaknesses of the proposed solution.

This project will replace current Token Ring network equipment with high-speed Ethernet equipment which is much more widely used, is more scalable, is easier to support, has greater flexibility and has lower acquisition, operational and maintenance costs. This project also includes replacing old, non-standard data wiring that is unable to support increased traffic loads required by business objectives and specified in our Information Technology Plan. The enterprise class Ethernet switches being proposed are more reliable than the Token Ring counterparts being replaced. The Ethernet switches have built-in redundancy, use "off-the-shelf" replacement parts and come with enhanced management features. The resulting infrastructure will be more reliable and easier to operate, troubleshoot and maintain. People skills required for operation and maintenance are widely available and competitive in salary scales.

This project can be divided into five general areas:

- Horizontal data cabling; work area to wiring closet
- Network wiring closets in each occupied floor/quadrant
- Backbone data cabling to tie each of the quadrants together
- A core Ethernet switch to provide communications between quadrants and the 501 Building
- Temporary equipment to support the Token Ring to Ethernet transition period

Most of the horizontal data wiring currently in place does not even meet old, obsolete Cat3 standards and has never been certified for the traffic loads in use. As bandwidth requirements increase the quality of the

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cable itself, terminations and cross-connects become much more critical. DOC has started re-cabling portions of the NSOB for other agencies. An estimated cost of \$214 per drop includes two phone and two data jacks, fiber from the lower level to each closet, new terminations in the wiring closets, removal of old cables and dedicated power in each of the closets. At an average number of 260 existing drops in each of 11 quadrants, total cost of new horizontal cabling is estimated at \$543,500. This expense includes \$374,000 for data and \$169,500 for voice. Double wiring all open floor ports currently in use will greatly reduce time and effort required for staff moves in the future. The Lower Level of the TSB building is being considered a quadrant for planning purposes as it must also be converted to Ethernet and is tied directly into the NSOB LAN. Because of the effort required to cable a quadrant with minimal disruption to production, it is assumed that one quadrant will be done at a time and require six weeks to complete. Total time to re-cable 11 quadrants is estimated at 18 months.

The existing mixture of Token Ring MAUs (Multi-station Access Units), CAUs (Control Access Units) and concentrators used in quadrant wiring closets would be replaced with high-speed Ethernet switches. All Ethernet switches would include management modules to enable remote monitoring and troubleshooting capabilities that do not exist with current Token Ring gear. Estimated cost of Ethernet switching equipment per closet would run between thirteen and fifty-five thousand dollars depending on type of equipment chosen. The least costly equipment would consist of stacked 24-port, high-speed Ethernet switches capable of 10Mb half-duplex to 100Mb full duplex transmission rates. The more costly equipment would consist of carrier class core switches with internal redundancy features and higher MTBF (Mean Time Between Failure) rates. A decision on the type of Ethernet switches to be used in quadrant closets has not been made at this time. This decision will be based on input from DOC and IMS, a cost/benefit analysis over the projected equipment life and bandwidth requirements. Individual workstations and networked printers will be audited to verify the availability of Ethernet NICs. Ethernet NICs have come standard on new workstation purchases the last few years but some may have to be purchased for older machines. Total estimated cost for Ethernet switches in all quadrant wiring closets is between \$143,000 and \$610,000.

In order to ensure adequate bandwidth between individual quadrant closets and the main distribution facility, this project includes running three pairs of multi-mode fiber from each quadrant closet to a main fiber collection point in the Lower Level of the NSOB. One pair will provide traffic flow, one pair will provide redundancy/backup and the third pair will be used for testing and additional backup. All fiber runs will be extended to the main distribution facility to be located in the 5th floor SE server room. Fiber installation will be done by the Division of Communications and follow their accepted guidelines and procedures. Some of the cost of this backbone cabling is covered by DOCs horizontal wiring charges. Additional estimated cost to ensure redundancy and backup is \$15,000.

In order to support the large number of local users and the main, local HHSS server farm, an enterprise class core Ethernet switch will be installed in the main distribution facility. Specific brand/model of this switch has not been determined at this point. This switch will have a high degree of built-in redundancy, a large number of gigabit interfaces for closet connectivity and key servers, hot-swappable components and extensive monitoring/management capabilities. Technical life expectancy of this switch is five years. Estimated cost of this switch is \$65,000.

In order to effectively transition from Token Ring to Ethernet over an extended (15 month) period of time with minimal disruption to ongoing production, an enterprise class switch with both Token Ring and Ethernet interfaces will be acquired. This switch is required to provide communication links between existing Token Ring and new Ethernet topologies. Specific brand/model for this piece of equipment has not been determined at this point. Estimated cost is \$35,000.

8. Address the following issues with respect to the proposed technology:

- Describe the reliability, security and scalability (future needs for growth or adaptation) of the technology.

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- Address conformity with applicable NITC technical standards and guidelines (available at <http://www.nitc.state.ne.us/standards/>) and generally accepted industry standards.
- Address the compatibility with existing institutional and/or statewide infrastructure.

The new infrastructure based on Ethernet topology will reduce long-term costs and improve security, reliability and scalability due to newer technology being implemented and the availability of on-going improvements being made with Ethernet and copper data cabling. Estimated life expectancy of enterprise class switches is three to five years. New data cabling will handle anticipated requirements for at least the next five to seven years. The new infrastructure will incorporate gigabit transmission rates to each quadrant closet, a 30-fold increase over existing bandwidth. Gigabit interfaces will also be made available to critical servers increasing bandwidth by at least a factor of 10. While there are no immediate plans to increase bandwidth to individual workstations, new data cabling and Ethernet switches in the quadrant closets would support a 20-fold bandwidth increase. Requirements specified for the Ethernet core switch include advanced monitoring, management and troubleshooting capabilities, hot-swappable components for quick problem resolution and built-in, fail-over redundancy for key components.

Ethernet topology is the industry standard. HHSS has implemented Ethernet topology in the vast majority of existing sites with great success. The use of high-speed Ethernet switches have proven to increase up time, improve performance and enhance Networking's ability to manage network services. DOC has endorsed the use of Cat5e wiring standards and requires Cat5e for all new copper data runs.

Section VI: Preliminary Plan for Implementation (10 Points)

9. Describe the preliminary plans for implementing the project. Identify project sponsor(s) and examine stakeholder acceptance. Describe the project team, including their roles, responsibilities, and experience.

Preliminary plans call for:

- a) Finalizing the conceptual network design and deciding on specific hardware based on ability to meet current and projected needs, cost, compatibility, reliability and supportability.
- b) Acquisition of a switch capable of handling both Token Ring and Ethernet traffic to facilitate the transition.
- c) Acquisition and installation of an enterprise class layer 3 Ethernet switch in the NSOB 5th floor wiring closet/server room.
- d) The installation of new horizontal data cabling between workstation locations and quadrant wiring closets.
- e) The installation of fiber between quadrant closets and the 5th floor main distribution facility.

Project team will consist primarily of Network Management and Operations personnel with input and assistance from Server Management and Operations, Hardware Management and Maintenance and the Department of Administrative Services' Division of Communications and Information Management Services.

10. List the major milestones and/or deliverables and provide a timeline for completing each.

Installation of enterprise class Ethernet switch - 45 days from approval to proceed
Installation of Token Ring/Ethernet switch and migration of Token Ring to this switch – 60 days from approval to proceed
Rewire quadrants – 45 days to have each of the eleven quadrants re-wired, 18 months total

11. Describe the training and staff development requirements.

No initial training will be required to implement.

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12. Describe the ongoing support requirements.

Equipment will be placed on support / maintenance agreements with vendor.

Section VII: Risk Assessment (10 Points)

13. Describe possible barriers and risks related to the project and the relative importance of each.

- a) There is a minor risk in obtaining resources from the Department of Administrative Services, Division of Communications and/or Information Management Services to assist with equipment installations and in getting data wiring installed in a timely manner.

14. Identify strategies which have been developed to minimize risks.

- a) DOC and IMS will play a key role in design and planning efforts. Sound project management practices include the identification and allocation of resources. Roles, responsibilities, resource requirements and milestones will be defined and agreed on in advance. While outside resource availability may impact timing of the project, it would have no impact on its success. The project plan is to build the new infrastructure in parallel to the existing infrastructure with each phase reliant on successful implementation of the previous phase.
- b) A work-around has been identified should the core Ethernet switch not be able to communicate directly with the mainframe. If necessary, a pair of Cisco 3640 routers could be installed using DLSW.

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Section VIII: Financial Analysis and Budget (20 Points)

15. Financial Information

Financial is included in the spreadsheet:



Excel Spreadsheet
(Double-click)

Project is estimated to take 18 months to complete. This includes 3 months to order, install, configure and test key hardware components and 15 months complete the data cabling based 45 days for each of the ten wiring closets.

Total costs are estimated at \$ 1,035,500 with expenditures spread across two budget cycles.
\$ 65,000 for the core Ethernet switch in the NSOB
\$ 35,000 for a layer 3 switch with both Token Ring and Ethernet capabilities for transition
\$543,500 for horizontal data wiring (\$169,500 for voice and \$374,000 data)
\$377,000 for Ethernet switches in the quadrant closets (middle of \$143,000 - \$610,000 range)
\$ 15,000 for fiber installation

16. Provide a detailed description of the budget items listed above. Include:

- An itemized list of hardware and software.
See above. More details will be provided as plan updated.
- If new FTE positions are included in the request, please provide a breakdown by position, including separate totals for salary and fringe benefits.
Not applicable
- Provide any on-going operation and replacement costs not included above, including funding source if known.
Included in above costs
- Provide a breakdown of all non-state funding sources and funds provided per source.

\$ 517,750 Federal
\$ 517,750 State

17. Please indicate where the funding requested for this project can be found in the agency budget request, including program numbers.

26-63-08 program 341

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Section VIII: Financial Analysis and Budget

(Revise dates as necessary for your request.)

	Estimated Prior Expended	Request for FY2003-04 (Year 1)	Request for FY2004-05 (Year 2)	Request for FY2005-06 (Year 3)	Request for FY2006-07 (Year 4)	Future	Total
1. Personnel Costs							\$ -
2. Contractual Services							
2.1 Design							\$ -
2.2 Programming							\$ -
2.3 Project Management							\$ -
2.4 Other		\$ 279,250.00	\$ 279,250.00				\$ 558,500.00
3. Supplies and Materials							\$ -
4. Telecommunications							\$ -
5. Training							\$ -
6. Travel							\$ -
7. Other Operating Costs							\$ -
8. Capital Expenditures							
8.1 Hardware		\$ 238,500.00	\$ 238,500.00				\$ 477,000.00
8.2 Software							\$ -
8.3 Network							\$ -
8.4 Other							\$ -
TOTAL COSTS	\$ -	\$ 517,750.00	\$ 517,750.00	\$ -	\$ -	\$ -	\$ 1,035,500.00
General Funds		\$ 258,875.00	\$ 258,875.00				\$ 517,750.00
Cash Funds							\$ -
Federal Funds		\$ 258,875.00	\$ 258,875.00				\$ 517,750.00
Revolving Funds							\$ -
Other Funds							\$ -
TOTAL FUNDS	\$ -	\$ 517,750.00	\$ 517,750.00	\$ -	\$ -	\$ -	\$ 1,035,500.00